

FORM PTO-1357 (Modified)
(REV 10-95)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

1370

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

09/700873

INTERNATIONAL APPLICATION NO.
PCT/DE 00/00772INTERNATIONAL FILING DATE
MARCH 11, 2000PRIORITY DATE CLAIMED
MARCH 24, 1999

TITLE OF INVENTION

WINDSHIELD WIPER

APPLICANT(S) FOR DO/EO/US

Joachim ZIMMER

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☐ A copy of the International Search Report (PCT/ISA/210).
8. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 18 below concern document(s) or information included:

13. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
A **SECOND** or **SUBSEQUENT** preliminary amendment.
16. ☐ A substitute specification.
17. ☐ A change of power of attorney and/or address letter.
18. ☒ Certificate of Mailing by Express Mail
19. ☐ Other items or information:

EF 042 304 175 US.

20 NOV 2000

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 09/700873	INTERNATIONAL APPLICATION NO. PCT/DE 00/00772	ATTORNEY'S DOCKET NUMBER 1370
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20. The following fees are submitted:				CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :					
<input type="checkbox"/> Search Report has been prepared by the EPO or JPO \$930.00					
<input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) \$720.00					
<input type="checkbox"/> No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) \$790.00					
<input checked="" type="checkbox"/> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$1,070.00					
<input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) \$98.00					
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$1,000.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).				\$0.00	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	22 - 20 =	2	x \$18.00	\$36.00	
Independent claims	1 - 3 =	0	x \$80.00	\$0.00	
Multiple Dependent Claims (check if applicable). <input type="checkbox"/>				\$0.00	
TOTAL OF ABOVE CALCULATIONS =				\$1,036.00	
Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable). <input type="checkbox"/>				\$0.00	
SUBTOTAL =				\$1,036.00	
Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).				\$0.00	
TOTAL NATIONAL FEE =				\$1,036.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). <input type="checkbox"/>				\$0.00	
TOTAL FEES ENCLOSED =				\$1,036.00	
				Amount to be: refunded	\$
				charged	\$

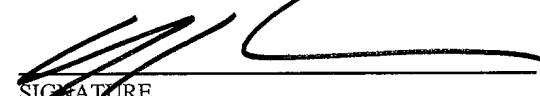
☐ A check in the amount of _____ to cover the above fees is enclosed.

☒ Please charge my Deposit Account No. **19-4675** in the amount of **\$1,036.00** to cover the above fees.
A duplicate copy of this sheet is enclosed.

☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **19-4675** A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

STRIKER, STRIKER & STENBY 103 EAST NECK ROAD HUNTINGTON, NEW YORK 11743	 SIGNATURE MICHAEL J. STRIKER NAME 27233 REGISTRATION NUMBER NOVEMBER 20, 2000 DATE
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UNITED STATES PATENT AND TRADEMARK OFFICE

Examiner: Group: Attorney Docket # 1370

Applicant(s) : ZIMMER, J.

Serial No. :

Filed : Simultaneously

For : WINDSHIELD WIPER

SIMULTANEOUS AMENDMENT

November 20, 2000

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

S I R S:

Simultaneously with filing of the above identified application
please amend the same as follows:

In the Claims:

Claim 4 line 1 and 2 delete "one of the foregoing claims", substitute with "claim 1".

Claim 6 line 1 and 2 delete "one of the foregoing claims", substitute with "claim 1".

Claim 7 line 1 and 2 delete "one of the foregoing claims", substitute with "claim 1".

Claim 8 line 1 and 2 delete "one of the foregoing claims", substitute with "claim 1".

Claim 10 line 1 and 2 delete "one of the foregoing claims", substitute with "claim 1".

Claim 11 line 1 and 2 delete "one of the foregoing claims", substitute with "claim 1".

Claim 13 line 1 and 2 delete "one of claims 11 or 12", substitute with "claim 11".

Claim 15 line 1 and 2 delete "one of the foregoing claims", substitute with "claim 1".

Claim 17 line 1 and 2 delete "one of claims 15 or 16", substitute with "claim 15".

Claim 18 line 1 and 2 delete "one of claims 17 or 16", substitute with "claim 16".

Claim 19 line 1 delete "one of claims 16-18", substitute with "claim 16".

Claim 20 line 1 delete "one of claims 16-19", substitute with "claim 16".

Claim 21 line 1 and 1 delete "one of the foregoing claims", substitute with "claim 1".

Claim 22 line 1 and 2 delete "one of the foregoing claims", substitute with "claim 1".

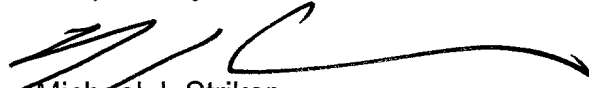
REMARKS:

This Amendment is submitted simultaneously with filing of the above identified application.

With the present Amendment applicant has amended the claims so as to eliminate their multiple dependency.

Consideration and allowance of the present application is most respectfully requested.

Respectfully submitted,



Michael J. Striker
Attorney for Applicant(s)
Reg. No. 27233

09/700873
20 NOV 2000

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526 Rec'd PCT/PTO 20 NOV 2000

WINDSHIELD WIPER

Prior Art

The invention is based on a wiper arm as generically defined by the preamble to claim 1.

5 Known windshield wipers have a wiper arm, which is made up of a fastening element and a hinge element, which is pivotably connected to it via a swivel joint and has a wiper rod. A hooklike end of the wiper rod engages a suspension box of a wiper blade, which is
10 formed by two side cheeks of a middle bracket and includes a hinge bolt. The hinge thus formed guides the wiper blade over the vehicle window during the swiveling motion. The wiper blade has what is as a rule a multi-member support bracket system, with subordinate brackets pivotably connected to the middle bracket, at least some of which subordinate brackets, with claws on their ends, retain a wiper strip by its head strip. The multi-member support bracket system and spring rails placed in
15 the head strip make it possible during wiping for the wiper strip to adapt, with a uniform contact pressure, to a curved windshield. To that end, a tension spring prestresses the swivel joint. The wiper arm is secured with its fastening element on a drive shaft and is driven by it in the wiping motion. Such windshield
20 wipers are known, for instance from German Patent Disclosure DE 37 44 237 A1. In simple versions, subordinate brackets, also known as intermediate brackets and claw brackets, can be dispensed with. In the simplest case, the middle bracket itself has claws,
25 with which it retains the wiper strip.
30

Windshield washing systems for vehicles are as a rule used in conjunction with windshield wipers. They are actuated if the moisture from precipitation does not suffice to clean the vehicle window. They include a water container, spray nozzles, and a pump which pumps water, sometimes admixed with cleaning and antifreeze agents, under pressure out of the water container to the spray nozzles. As a rule, the spray nozzles are secured to some part of a vehicle body, such as a hood, window frame, or the like. To prevent the spray nozzles from freezing at temperatures below the freezing point, heating elements are integrated into the spray nozzles and communicate with a power supply via plugs located on the outside. The heating elements require relatively great effort and expense for producing the spray nozzles and great effort and expense for assembly for laying the electric lines and contacting the plugs. Furthermore, the highly volatile antifreeze agents rapidly evaporate, and the nozzle openings become plugged with the residues.

It is already known to secure spray nozzles as additional components on the wiper blade and thus to distribute the spraying water over the wiping region directly with a short stream length. Since the spraying water is concentrated on a region in the vicinity of the wiper blade and is wiped off again in the briefest time by the wiping motion, the view is hindered only briefly by the spraying water applied. A disadvantage of such systems is that the effects of weather, especially hail and extreme sunshine, have a major effect on the flexible parts of this arrangement, which are required for spanning the jointed regions between the wiper arm and the wiper blade. The spray nozzles and water lines

that are exposed to the relative wind also freeze up quickly at temperatures below the freezing point, unless enough antifreeze is added to the water. As a rule, thawing the frozen water lines and spray nozzles again can be done only with major effort.

In an earlier German patent application, DE 198 15 171.3, a wiper arm is described, on whose hinge element, or on a wiper rod integrally joined to the hinge element, spray nozzles are disposed. These nozzles have a nozzle body, which is accommodated in a bulge of the hinge element with an opening for the spray stream, or is clipped, protruding downward, in a lateral mount on the wiper rod. It is also possible for two nozzle bodies to be provided, which are joined together by a rigid or flexible connecting piece. The nozzle bodies can be replaced easily and are well protected against environmental factors.

Expediently, the spray nozzle has an outward-opening check valve, which prevents the water line from running empty if the washer system goes unused for relatively long periods, or if water escapes during wiping operation without any washing function, especially at high wiping frequencies and/or with stroke-controlled wiper arms. Furthermore, washing water and antifreeze is prevented from evaporating in the region of the spray nozzle, especially in the case of a heated spray nozzle, and narrowing or plugging up the spray nozzle with deposits.

A heater which is passed in the form of a wire through a water supply lead and is embodied as a heating coil in the nozzle body is integrated with the wiper

system. The heater fits only one type of windshield wipers, so that a large number of different heating devices must be kept in stock. Furthermore, there are simple versions in which the nozzle bodies are integrally joined together and produced as a plastic injection-molded part. By means of the nozzle bodies distributed on the wiper arm, the spraying water is well distributed over the wiper region, especially if a spray stream is aimed at a lower region directly in front of the wiper blade. Since short stream lengths result from this arrangement, even at relatively high vehicle speed the relative wind can have only little effect on the distribution of spraying water.

Advantages of the Invention

According to the invention, at least one spray nozzle is disposed on a retaining element. The retaining element can be a wiper arm and/or a wiper rod. The spray nozzle has a housing, which includes a water conduit from which a connecting conduit branches off. The water conduit can also be formed by a nozzle body that is inserted into the housing. From the water conduit, a connecting conduit branches off, leading to a spray conduit that is virtually parallel to the water conduit and is closed on its free end. With only a few modifications, such an arrangement makes numerous variants possible, with which the demands for various installation situations on a wiper arm can be met. The spray nozzle is constructed from a plurality of functional units that can be put together as needed.

In one feature of the invention, the housing is retained, for instance clipped, in an opening of the

retaining element. A nozzle body with a stub
surrounding the spray conduit is inserted from outside
into the opening, protruding through the retaining
element, of the connecting conduit of the housing. The
5 outer part of the nozzle body has a nozzle opening and
covers the housing and the opening of the retaining
element. Hence the structural parts can be quickly
joined to one another separably, and they can also
easily be replaced individually. The spray nozzle
10 protrudes out of the retaining element with only the
outer part of the nozzle body, and that part fits
smoothly with the contour of the retaining element, so
that both visually and in terms of fluidics it is not a
hindrance and it causes no noise.

For wipers with relatively long wiper blades, a
plurality of spray nozzles are needed. For this
purpose, a variant of the invention provides a water
conduit, for those spray nozzles located toward the
front in the flow direction, which on its free end has a
20 connection piece to a water line leading onward that
leads to a further spray nozzle. Instead of the
connection piece, a closure cap is clipped into the last
spray nozzle, and this closure cap closes the continuous
water conduit. To enable good adaptation of one of the
25 spray nozzles and the water lines to the applicable
retaining elements, instead of integrally formed
straight or offset- bent connection pieces, inserted
connection pieces are provided, and thus the housing
and/or the nozzle body is the same for various
30 connecting parts or closure parts. The connecting water
line having the spray nozzles is optimally adapted to
the existing installation space by means of a suitable
selection of structural parts.

The visual and fluidic effect depend essentially on the extent to which the spray nozzle protrudes out of the retaining element. It is therefore expedient for the nozzle body having the orifice of the spray conduit to protrude far enough out of an opening of a retaining element that the inner wall of the spray conduit or nozzle opening, which wall is oriented toward the retaining element, is flush with the outer wall of the retaining element. As a result, despite a shallow design, the spray stream can be aimed largely parallel to the retaining element or in other words the wiper arm. An especially shallow design is obtained if the nozzle opening is formed directly into the nozzle body or into a nozzle cap and is an integral component of the nozzle body. The nozzle cap is expediently seated disconnectably on a stub of the nozzle body. In the event of wear or damage it can easily be exchanged, or it can be replaced with a nozzle cap having a different spray stream geometry. If the nozzle cap is supported on a ball seat of the stub, then the spray stream can be adjusted even after the spray nozzle has been installed.

As a rule, the spray conduit upstream of the nozzle opening is wider than the nozzle opening itself. It is therefore expedient to place the nozzle opening on the outer edge of the spray conduit, in order to reduce the extent of protrusion of the spray nozzle from the retaining element. This is especially simple if the nozzle opening is integrated with the nozzle body or nozzle cap. In order to carry the washing water in a streamlined way to the nozzle opening, it is advantageous that the nozzle cap has a guide body, which leads to the nozzle opening and in the installed state of the nozzle cap engages the spray conduit.

According to the invention, the nozzle opening is disposed in the upper region of the retaining element; this makes the impact angle of the spray stream as steep as possible. When the impact angle is steep, the impact area varies less as a function of tolerances that can occur with regard to the direction of the stream. As a rule, one nozzle opening suffices. By means of a plurality of nozzle openings disposed vertically one above the other, the wettable impact area can be increased without having the spray nozzle protrude farther out of the retaining element.

The nozzle body of the spray nozzle is made from plastic and is clipped into the housing, so that its continuous water conduit communicates with the water line. A connecting conduit that leads to a spray conduit with a nozzle opening branches off from the water conduit. Upon pressure buildup of the pump, water is forced out of the supply tank through the lines of the system as far as the nozzle opening, whereupon it passes through the nozzle opening into the open air. In the pressureless state, some of the water continues to flow, so that the lines are partly emptied. To prevent the lines from running empty, a variant of the invention provides a check valve. A diaphragm closes the connecting conduit in the pressureless state. The diaphragm can be located close to the nozzle opening, so that only a small volume of water is stored between the diaphragm and the nozzle opening and accordingly can escape or evaporate in an uncontrolled way. The diaphragm is embodied as a rubber-elastic tubular diaphragm, which has beads on its ends. The beads are embedded in annular grooves of the nozzle body. When the water flows in through the connecting conduit, an

annular chamber at the circumference of the nozzle body is filled, and the diaphragm is spread open. In the process, the diaphragm is braced on the outside on the housing and uncovers the discharge openings of the connecting conduit and of the spray conduit at the circumference of the nozzle body. In order that only the ambient pressure and the prestressing of the diaphragm will have to be overcome for opening purposes, a ventilation bore is located on the nozzle housing. The opening pressure of the diaphragm is slight, and thus the system can be operated at a relatively small pump capacity.

The nozzle body can easily be made from plastic by injection molding. Its outer diameter decreases between the annular grooves on both ends, so that the tubular diaphragm on its ends is retained sealingly between the housing and the nozzle body, but in the region of the annular chamber at the circumference of the nozzle body has sufficient radial clearance that it can uncover large enough flow cross sections. The smooth outer cylindrical or conical contour is thus preserved.

To make the spray nozzles capable of winter operation as well, they are heated. The heating line advantageously leads through the entire water line and through the water conduits. The diaphragm valves close off the water chamber from outside and thus prevent the heated from evaporating and calcifying the spray nozzles. With the aid of the diaphragm valves, the water is also trapped in the system during periods of nonuse. Thus in pulsed spraying, the washing water can be sprayed at the right moment in front of the wiper blade. In order not to hinder the view of the driver,

the water sprays during the upward motion of the wiper arms, but in downward wiping no water can dribble after it.

5 A smaller structural volume of the communicating spray nozzles is obtained by providing that the water and energy supply are integrated in one element, so that there is no need for electrical contacting of the heating and the nozzles. Good energy transmission is attained, since there is only a slight spacing between 10 the water conduit and the nozzle opening. Making the nozzle body from plastic provides thermal insulation from the outside, so that the heat output is concentrated especially on the nozzle opening and the water. This leads to a lower energy consumption.

15 The heated water improves the cleaning action, so that not only water consumption but especially the consumption of polluting additives can be reduced.

Drawing

20 Further advantages will become apparent from the ensuing description of the drawing. In the drawing, exemplary embodiments of the invention are shown. The drawing, description and claims include numerous characteristics in combination. One skilled in the art will expediently consider the characteristics 25 individually as well and put them together to make useful further combinations.

Shown are:

Fig. 1, a longitudinal section through a spray

Description of the Exemplary Embodiments

5 A spray nozzle 10 is secured to a pivotable part of a wiper arm, not shown in further detail. The pivotable part will hereinafter be called a retaining element 14, and it can be a fastening part, a hinge part and/or a wiper rod connected to the hinge part, or part of a wiper blade.

10 The spray nozzle 10 comprises a housing 16, which is separably connected by means of a connection piece 32 via a water line 18 to a water pump 118, which from a supply tank 120 pumps washing water to the spray nozzle 10 (Fig. 12). The housing 16 is made from plastic and surrounds a water conduit 20, which is closed on its free end 38 and from which a connecting conduit 22 branches off. The connecting conduit 22 leads to a spray conduit 24 having a nozzle opening 26. The housing 16 is clipped into an opening 34 of the retaining element 14 and is fixed and retained by means of integrally formed lugs 40 and 42. A nozzle body 12 has a stub 30, which surrounds the spray conduit 24 and with which, via a plug connection, it engages an opening 36 of the housing 16. The outer part 44 of the nozzle body 12 has at least one nozzle opening 26 and covers the opening 34 in the retaining element 14. The nozzle body 12 protrudes with the orifice 28 of the spray conduit 24 far enough out of the opening 34 of the retaining element 14 that the inner wall, toward the retaining element 14, of the spray conduit 24 or of the nozzle opening 26 is flush with the outer wall 46 of the retaining element 14.

Fig. 3 schematically shows how the spray nozzle 10

is disposed in the opening 34 of a leg 52 of the retaining element 14. The nozzle opening 26 is located in the upper region 50 of the retaining element 14. In a further variant, the opening 34 extends over part of the leg 52 and of the top wall 54 (Fig. 4). If there are a plurality of nozzle openings 26, they can be disposed vertically one above the other in the upper region 50 (Figs. 5 and 6). Disposing the nozzle openings 26 in the upper region 50 of the retaining element 14 results in a steep impact angle α of the stream of water, and this has a good cleaning effect. Furthermore, the impact point shifts only slightly as a function of production variations and wear.

Fig. 1 shows a nozzle opening 26 which is integrated with the nozzle body 12 and does not allow adjusting the spray stream. To enable adjusting the spray stream, a variant provides a ball 48, which has a nozzle opening 26 and is press-fitted into a ball seat 56 of the spray conduit 58 (Fig. 7). A further variant shows a spray conduit 60 in an integrally formed stub 62, on which a nozzle cap 64 that has a nozzle opening 26 is seated (Fig. 8). Fig. 7 shows the nozzle cap 64 enlarged and clipped onto the stub 62. The nozzle opening 26 is disposed in the region of the outer inner wall 68 of the spray conduit 60. The nozzle cap 64, on the side toward the nozzle body 86, also has a guide body 70, which converges on the nozzle opening 26 and engages the widened spray conduit 60. The guide body 70 brings about a streamlined course of the water in front of the nozzle opening 26.

Embodying the nozzle cap 64 in this way does not allow adjusting the nozzle opening 26. To enable making

an adjustment, a variant of the invention provides a nozzle cap 66, which with its spherical inside surface 76 is seated on a ball seat 78 of the integrally formed stub 74 (Fig. 10).

Fig. 1 shows a simple design of the spray nozzle 10, which has no check valve. Fig. 11 shows a variant of the spray nozzle 10 with a tubular diaphragm 80, which acts as a check valve and is accommodated in an annular chamber 124, and which on its ends having beads 92, 94 sealingly engages annular grooves 96, 98 of the nozzle body 86. By the imposition of a pump pressure, water flows from a water line 18 through a water conduit 20 into the connecting conduit 22, which discharges into the annular chamber 124 inside the tubular diaphragm 80 with a discharge opening 90, and spreads the tubular diaphragm 80 open. The water enters a chamber between the tubular diaphragm 80 and the nozzle body 86 and from there flows into the spray conduit 24, which also has a discharge opening 88 in this chamber, which discharge opening is controlled by the tubular diaphragm 80. When the tubular diaphragm 80 lifts up from the nozzle body 86, after a certain opening travel it presses against the housing 82. This prevents the tubular diaphragm 80 from overstretching at relatively high spray pressures. At least one ventilation bore 84 is provided in the region of the tubular diaphragm 80 in the housing 82, so that the air between the tubular diaphragm 80 and the housing 82 can escape from the annular chamber 124 upon opening. In the closed state, the tubular diaphragm 80 rests with intrinsic tension on the nozzle body 86. It closes the discharge openings 88 and 90 and thus disconnects the water conduit 20 from the spray conduit 24. The tubular diaphragm 80 comprises an elastomer.

To lend the tubular diaphragm 80 sufficient clearance for motion without increasing the installation space and without deviating from a regular outer contour, the outer diameter of the nozzle body 86 is decreased in the region between the annular grooves 96 and 98. The mean outer diameter of the nozzle body 86 also increases toward the nozzle opening 26. As a result, both material and weight can be saved, and the available installation space can be optimally utilized.

Windshield wipers with relatively long wiper blades require a plurality of spray nozzles 10. To that end, a variant of the invention provides a water conduit 20, which on its free end 38 has a connection piece 100 to a water line 122 that leads onward. The water line 18 connects all the spray nozzles 10 to one another (Fig. 12). Instead of the connection piece 100, a closure cap 110, which closes the continuous water conduit 20, is clipped into the last spray nozzle 10. To achieve the best possible adaptation of the spray nozzles 10 and the parts of the water line 18 to the respective retaining elements 14, a plurality of variants of connection pieces 100, 112 and closure caps 110, 114 are provided. Fig. 12 shows an offset-bent, inserted connection piece 100 and an offset-bent, inserted closure cap 110. Fig. 11 shows a straight, integrally formed connection piece 112, and Fig. 8 shows a straight closure cap 114 that is slipped on. The entire system, comprising the connecting water line 112 and the spray nozzles 10, can thus be adapted optimally by means of a suitable selection of component parts.

A heating line 116 leads through the water lines 18, 122 and the water conduits 20 of the spray nozzles

5

10. The nozzle body 86, which is expediently embodied in one piece, is produced as a plastic injection-molded part. As a result, the water in the nozzle body 86 is thermally insulated, so that even at low temperatures only a slight heating output is necessary. This kind of internal heating and a favorable selection of the materials used for the component parts employed result in a small structural volume and economies in terms of energy and expense.

Claims

1. A windshield wiper having a wiper arm, which is driven via a drive shaft and to which a wiper blade is pivotably connected, in which at least one spray nozzle (10) is disposed on a pivotable part (14), the spray nozzle being composed of a plurality of parts and its housing (16) communicating disconnectably via a water line (18) to a water pump (118), characterized in that in the housing (16) or in a nozzle body (12) communicating with it, a continuous water conduit (20) connected to the water line (18) is provided, from which a connecting conduit (22) branches off that leads to a spray conduit (24) that is approximately parallel to the water conduit (20) and has a nozzle opening (26), the water conduit (20) being closed on its free end (38).

2. The windshield wiper of claim 1, characterized in that the housing (16) and/or the nozzle body (12) is of plastic, and the nozzle body (12) is clipped into the housing (16).

3. The windshield wiper of claim 1, characterized in that the housing (16) is retained in an opening (34) of a retaining element (14), and the nozzle body (12) has a stub (30) surrounding the connecting conduit (22), with which stub, via a plug connection, it engages the inside of an opening (36) of the housing (16), and the outer part (44) of the nozzle body (12) has a nozzle opening (26) and covers the opening (34) of the retaining element (14).

4. The windshield wiper of one of the foregoing

claims, characterized in that a connection piece (100) to an onward-leading water line (122) or a closure cap (110) adjoins the water conduit (20) on its free end (38).

5. The windshield wiper of claim 4, characterized in that the connection piece (100) is offset-bent.

6. The windshield wiper of one of the foregoing claims, characterized in that the nozzle body (12) with the orifice (28) of the spray conduit (24) protrudes in such a way from an opening (34) of the retaining element (11) that the inner wall of the spray conduit (24) or of the nozzle opening (26), which wall is toward the retaining element (14), is flush with the outer wall (46) of the retaining element (14).

7. The windshield wiper of one of the foregoing claims, characterized in that the nozzle openings (26) are disposed in the upper region (50) of the retaining element (14).

8. The windshield wiper of one of the foregoing claims, characterized in that a plurality of nozzle openings (26) are disposed vertically one above the other.

9. The windshield wiper of claim 9, characterized in that the retaining element (14) has a U-shaped cross-sectional profile, and the opening (34) extends across a part of a leg (52) and a top wall (54).

10. The windshield wiper of one of the foregoing claims, characterized in that a ball (48) is press-

fitted with the nozzle opening (26) into a ball seat (56) of the spray conduit (58).

11. The windshield wiper of one of the foregoing claims, characterized in that the orifice of the spray conduit (60) is formed by a stub (62) integrally formed onto the nozzle body (12), onto which stub a nozzle cap (64) that has a nozzle opening (26) is placed.

12. The windshield wiper of claim 11, characterized in that the nozzle cap (66) is of plastic and is clipped onto a ball seat (78) of the stub (74).

13. The windshield wiper of one of claims 11 or 12, characterized in that the nozzle opening (26) is disposed in the region of the outer inner wall (68) of the orifice of the spray conduit (60).

14. The windshield wiper of claim 13, characterized in that the nozzle cap (64, 66), with a guide body (70, 72) that converges on the nozzle opening (26), engages the widened spray conduit (60) on the side of the nozzle cap toward the nozzle body (12).

15. The windshield wiper of one of the foregoing claims, characterized in that the connecting conduit (22) and the spray conduit (24) discharge into an annular chamber on the circumference of the nozzle body, and their discharge openings (88, 90) are covered by a diaphragm (80).

16. The windshield wiper of claim 15, characterized in that the diaphragm is a rubber-elastic tubular diaphragm (80) and has beads (92, 94) on its

ends that are embedded in annular grooves (96, 98) of the nozzle body (86).

17. The windshield wiper of one of claims 15 or 16, characterized in that a ventilation bore (84) is provided on the circumference of the tubular diaphragm (80) in the housing (82).

18. The windshield wiper of one of claims 17 or 16, characterized in that the tubular diaphragm (80), after a predetermined opening stroke, is braced on a wall of the housing (82).

19. The windshield wiper of one of claims 16-18, characterized in that the outer diameter of the nozzle body (86) decreases in the region between the annular grooves (96, 98).

20. The windshield wiper of one of claims 16-19, characterized in that the outside diameter of the nozzle body (86) tapers conically toward the water line (18).

21. The windshield wiper of one of the foregoing claims, characterized in that a heating line (116) extends through the water line (18) and the water conduit (20).

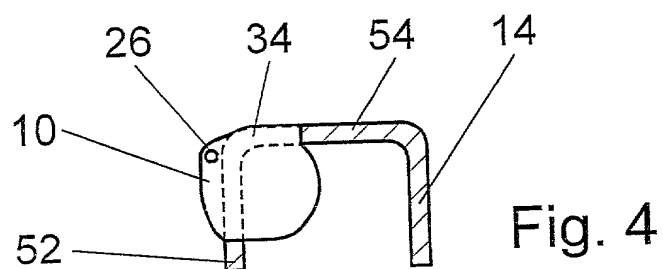
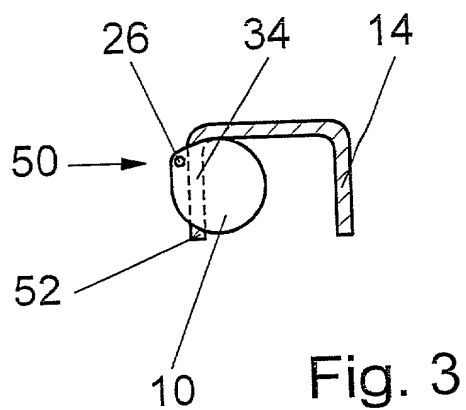
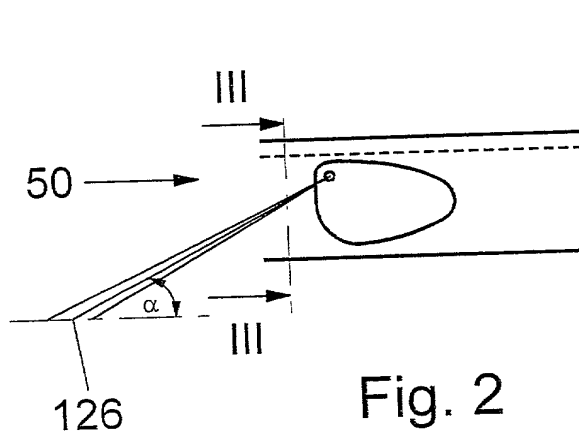
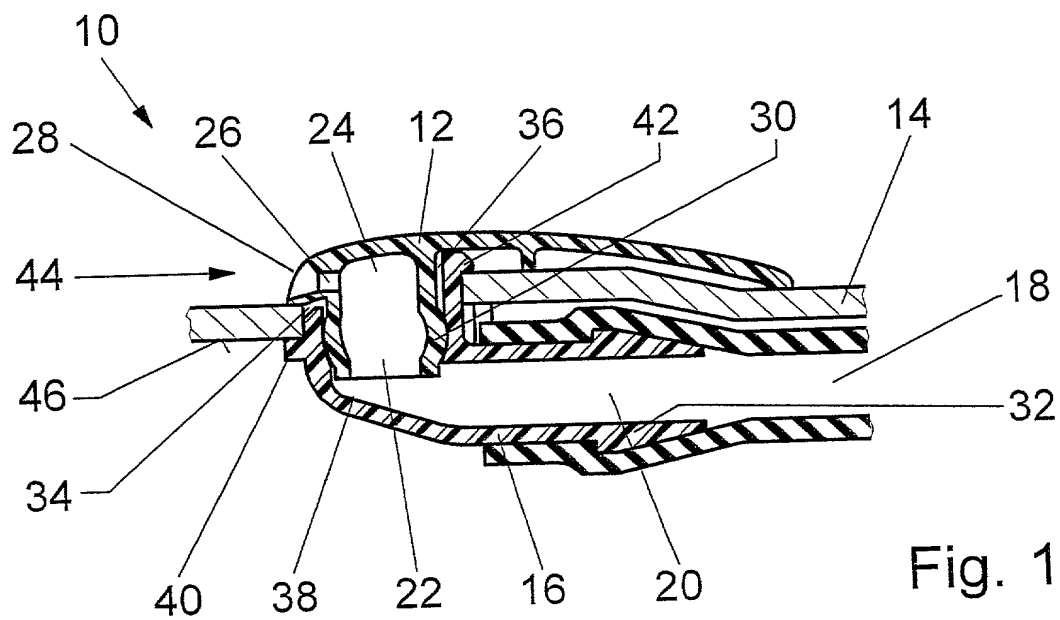
22. The windshield wiper of one of the foregoing claims, characterized in that the nozzle body (86) is embodied as a distributor.

Abstract

The invention is based on a windshield wiper having a wiper arm, which is driven via a drive shaft and to which a wiper blade is pivotably connected, in which at least one spray nozzle (10) is disposed on a pivotable part (14), the spray nozzle being composed of a plurality of parts and its housing (16) communicating disconnectably via a water line (18) to a water pump (118).

It is proposed that in the housing (16) or in a nozzle body (12) communicating with it, a continuous water conduit (20) connected to the water line (18) is provided, from which a connecting conduit (22) branches off that leads to a spray conduit (24) that is approximately parallel to the water conduit (20) and has a nozzle opening (26), the water conduit (20) being closed on its free end (38).

(Fig. 1)



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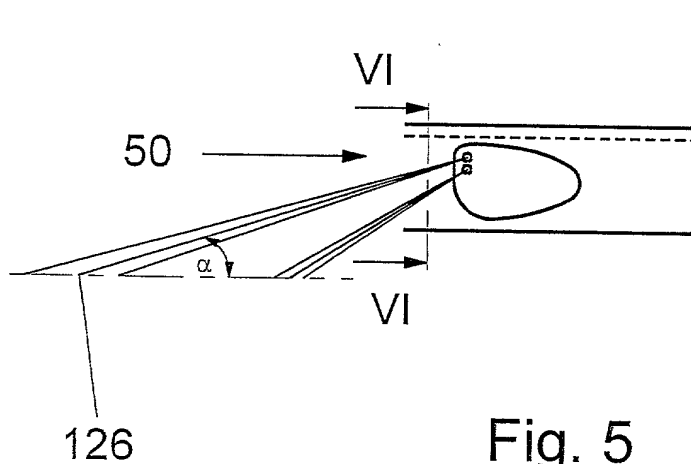


Fig. 5

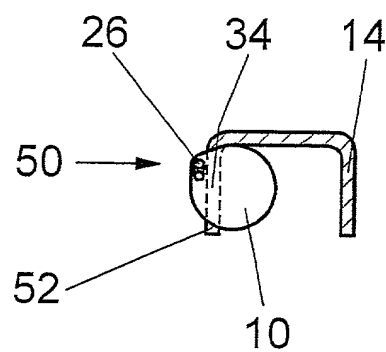


Fig. 6

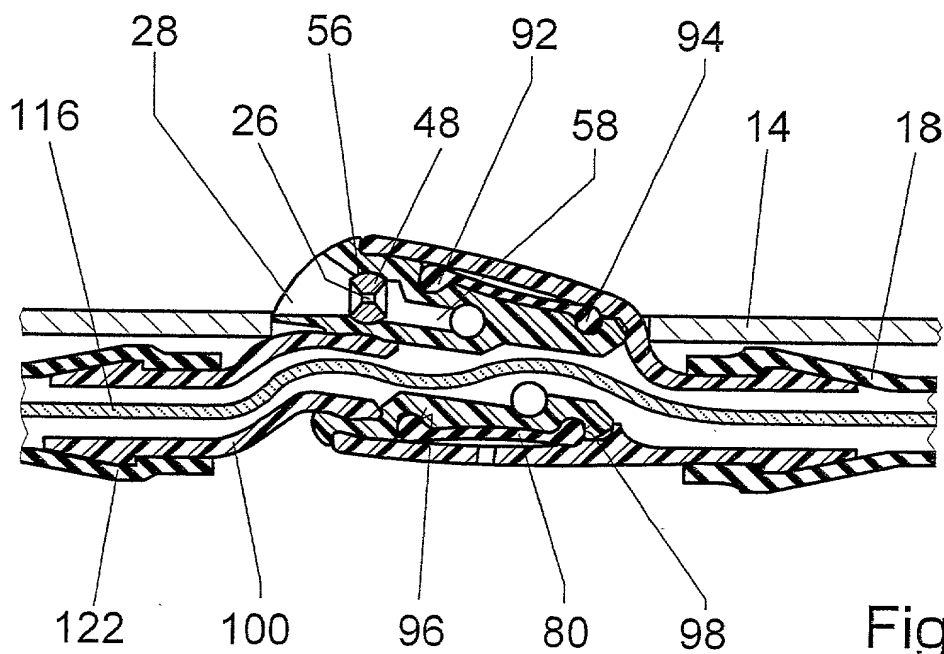
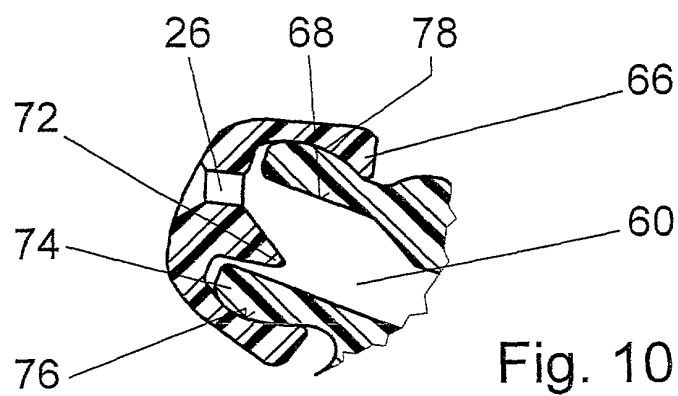
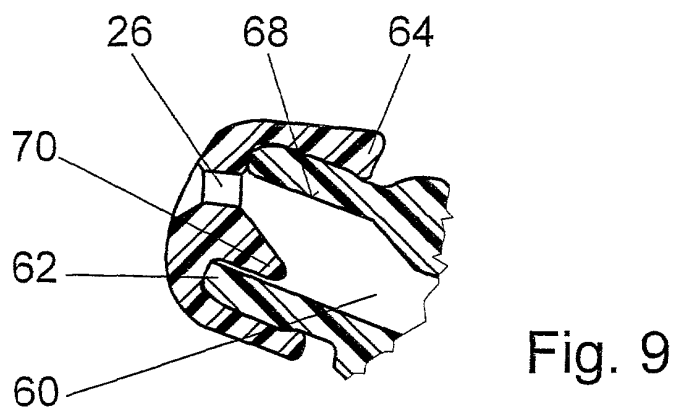
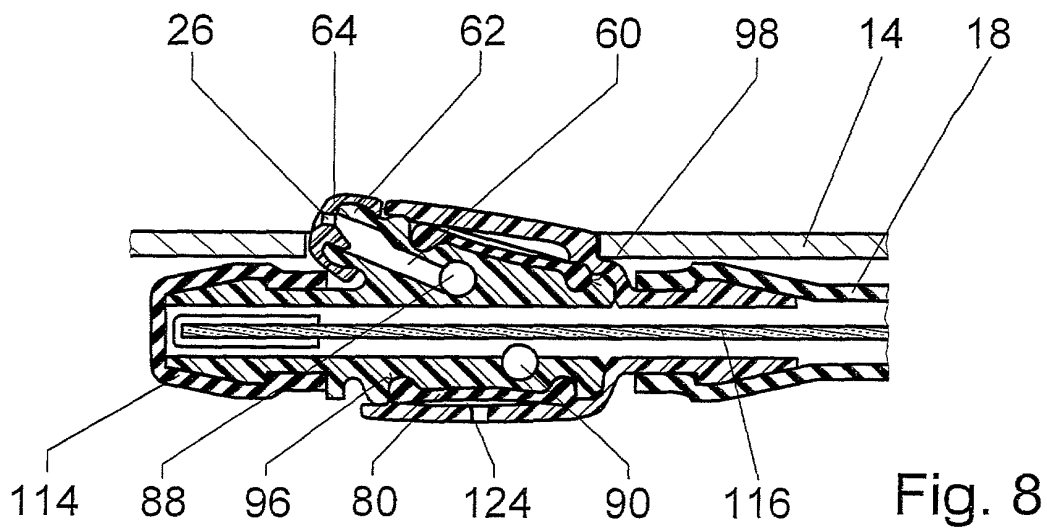


Fig. 7

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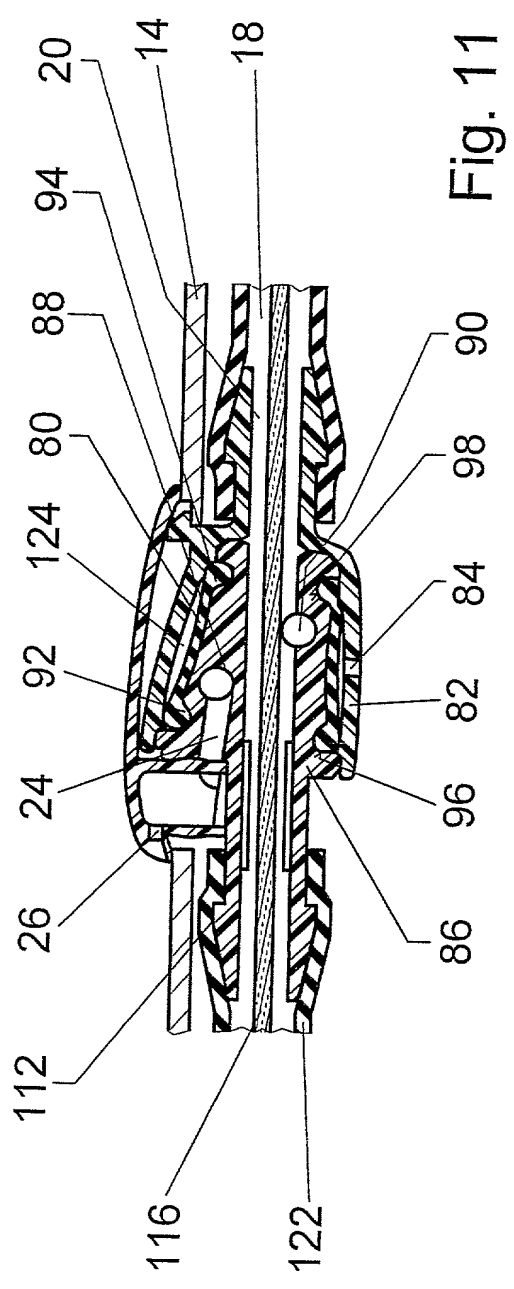


Fig. 11

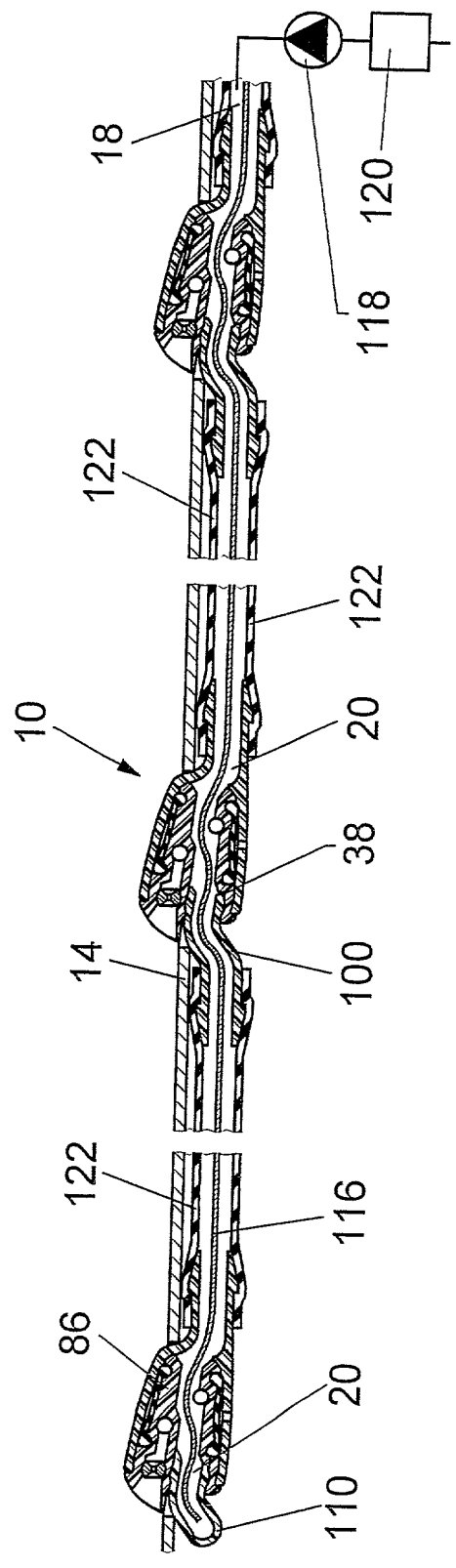


Fig. 12

R. 34971

DECLARATION AND POWER OF ATTORNEY FOR NATIONAL STAGE OF PCT PATENT APPLICATION

As a below-named inventor, I hereby declare that:

Joachim ZIMMER

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled **WINDSHIELD WIPER** the specification of which was filed as PCT International Application number PCT/DE 00/00772 on March 11, 2000.

I hereby state that I believe the named inventor or inventors in this Declaration to be the original and first inventor or inventors of the subject matter which is claimed and for which a patent is sought.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose all information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365 (b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior foreign application(s):

Priority claimed:

<u>199 13 193.7</u>	<u>GERMANY</u>	<u>MARCH 24, 1999</u>	<u>X</u>	
(Number)	(Country)	(Date filed)	Yes	No
<u> </u>	<u> </u>	<u> </u>	<u>Yes</u>	<u>No</u>
(Number)	(Country)	(Date filed)	Yes	No

As a named inventor, I hereby appoint the following attorney to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

/ Michael J. Striker, Reg. No. 27233

Direct all telephone calls to Striker, Striker & Stenby at telephone no.: (631) 549 4700 and address and all correspondence to:

STRIKER, STRIKER & STENBY
103 East Neck Road
Huntington, New York 11743
U.S.A.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such wilful false statement may jeopardize the validity of the application or any patent issued thereon.

Signature: <i>Joachim Zimmer</i>	Date: <i>14.11.2000</i>	Residence and Full Postal Address: Uhlandstrasse 5 77880 Sasbach Germany <i>DEX</i>
Full Name of First or Sole Inventor: <u>Joachim ZIMMER</u>	Citizenship: GERMAN	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Second Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Third Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Fourth Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Fifth Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Sixth Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Seventh Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Eighth Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Ninth Inventor:	Citizenship:	